proportion of each switch vendor type based on state-specific market shares specified by the user. For example, if a 50%/50% share is input as default, then the switch investment for those switches left undefined is a weighted average of 5ESS and DMS-100.

Derived Inputs--BCPM determines whether each switch is a host, remote, or standalone based on the CLLI and Host CLLI fields. If a switch has a Host CLLI, then it is tagged as a remote. If a switch has its CLLI designated as any other switch's host CLLI, then it is tagged as a host. Otherwise, it is tagged as a standalone.

The number of residence lines and business lines is obtained from the BCPM Loop module. Engineered lines are calculated from working lines and the percent fill. The number of trunks is calculated from the line/trunk ratio.

7.4.3 Switch Functional Investment Development Process

The objective of the first phase is to determine the total switch investment (in dollars) associated with each switch functional category, for each CLLI under study. Six switch functional categories have been identified: 1) Processor Related Cost; 2) Line Termination - MDF and Protector; 3) Line Port Cost; 4) Line CCS Usage; 5) Trunk CCS Usage; and 6) SS7. These functional categories are designed specifically to accommodate and be compatible with the extensive modeling work previously performed by companies such as U S WEST and Bellcore.

Functional investments can be developed via three distinct methods. The first method utilizes the BCPM Investment Development Process within BCPM. The second method develops functional investments with an Audited LEC Switching Model (ALSM) that can be input directly into the Model. The third method uses a total switch investment from any other source, such as regulatory reports filed by local exchange carriers. The third method separates the total investment dollars into functional categories based on category percentages developed within the Functional Investment Development Process. BCPM allows the user to incorporate a mixture of functional investments from all three sources within a model run. As a default, BCPM calculates its own functional investments for each CLLI being studied in the run. The user has the option of providing ALSM and/or other investments for each CLLI. Before the universal service investments are computed, the Model chooses the investment source to use for each individual CLLI.

7.4.3.1 BCPM Method

The first approach, The BCPM Investment Development Process, is most appropriate to use when detailed specific switch by switch data is unavailable. The steps in the BCPM Investment Development Process are:

- Data Collection and Regression and
- Functional Investment Development.

The Data Collection and Regression process, which is performed outside of BCPM, results in a set of regression coefficients and equations that form "switch curves" for host, remote, and standalone switches. BCPM takes these switch curves as input and combines them with switch-specific data, such as the number of lines on each switch, to produce the Functional Investment by category for each switch.

7.4.3.1.1 Data Collection and Regression Process (Switch Curve Development)

Initially, BCPM Sponsor Companies provided non-discounted total Functional investments for statistically valid samples of 5ESS® and DMS-100® switches, and their associated remotes, covering a reasonable range of switch sizes and remote sizes.[37] (The data provided includes vendor provided Engineering, Furnished, and Installation, EF&I.) The Sponsor Companies developed these investments by running ALSMs using detailed engineering data for the switches studied. This data includes the total switch investments for each of the Functional Investment categories outlined above.

Each Functional Investment sample is used as a dependent variable in a regression function. Regression analysis entails regressing total switch investment utilizing a set of multiple independent variables, e.g. number of lines, number of trunks, that explain changes in total switch investment. The regression coefficients indicate the dollar change in total switch investment for a one unit increase in the independent variable. For example, if the coefficient on number of lines is 175 this indicates that increasing the number of lines by one causes a $175 increase in total switch investment. Once these coefficients have been estimated, detailed data on these independent variables for specific serving wire centers enable the analyst to estimate the total switch cost associated with that serving wire center.

The dependent variables are regressed against the following independent variables:

- Standalone/Host / Remote Indicator;
- Number of Lines;
- Number of Trunks;
- Busy Hour Calls per Line;
- Busy Hour CCS per Line; and
- Switch / Remote Vendor / Type.

The ALSM runs also collect appropriate information on the switch (data that will be available in the BCPM public data sources) to allow further analysis of additional factors related to the cost of switching. These analyses are discussed in the Switch Cost Refinement section below.

This regression process results in a coefficient matrix of Switch Functional Investments by BCPM Input Data type (e.g., number of lines, CCS per line). This coefficient matrix is supplied as an input table to BCPM. The user can substitute other known relationships for the values in the coefficient matrix table. Caution is advised, however, as the investment results are highly sensitive to some of the coefficient values. The user should thoroughly understand regression analysis and the effect of each coefficient and constant in the table before attempting to substitute values.

7.4.3.1.2 BCPM Investment Development

This process creates the default investment values for the functional investment categories.

Once the regression coefficient table has been developed from the step above, preliminary switch functional investments are developed. The BCPM Input Data values (either user input or flows from other BCPM system modules) for each switch and remote CLLI for the study area are multiplied by their corresponding regression coefficients. Some of these BCPM input data values can be the same as those used to develop the regression coefficients, or can be state or national default values, as available. The detailed steps in developing the investments are:

Calculate Total Investments and Bucket Dollars--The total investment and each bucket investment are calculated by multiplying each category's coefficients by the corresponding switch specific data input. The Model selects the proper set of coefficients (standalone, host, or remote) base on the switch type derived in the input process. For example, a standalone switch investment might be $3m plus $350/line times the number of lines plus $550/trunk times the number of trunks. The Model differentiates between 5ESS and DMS-100 switches by making the switch type a dummy variable. If the switch is a 5ESS, for example, an additive or a credit may be applied to some of the coefficients.

If the switch vendor was left undefined in the user data table, then the Model uses switch market share for the dummy variable. For example, the 5ESS additive for the constant coefficient of the total investment equation might be -$1m. If the switch were undefined and the user had specified a 50% market share for 5ESS, then the additive would be -$1m * 50% or -$0.5m.

The exception to this coefficient process is the SS7 bucket, which is treated as a constant investment based on a global user input.

Adjust Bucket Dollars--The individual bucket estimations, when summed, produce a total investment that is slightly different from the direct total investment estimation. The individual buckets equations tend to be somewhat less precise than the total estimation. Therefore, it is necessary to adjust each bucket share to ensure that the individual buckets sum to the correct total. This is done by dividing the summed bucket total into the estimated total to create an adjustment factor. The adjustment factor is then applied to the individual buckets to bring them into alignment.

Apply Discounts--The final step in BCPM Investment Development is to apply the company-specific discount factors to these investments. The discount factors are based on vendor discount levels supplied to an input table by the model user. The discounts are multiplied by a set of Discount Adjustment Factors that are supplied with the Model to produce an effective discount level by FCAT. The effective discount level by FCAT varies because vendor discounts are applied to material items only. The ratio of material to vendor labor and installation varies by FCAT, hence the difference in effective discounts. The Discount Adjustment Factors are the result of a special study performed by BellSouth. This study compared the average effective discount level by

FCAT to the non-discounted investments for a sample of central offices of various sizes. The Discount Adjustment Factors are specific to the switch vendor and type (host/standalone or remote).

7.4.3.2 ALSM Method

The ALSM method can be implemented when detailed switching investment information is available for each specific switch. This is typically the case with larger LECs and is generally the output provided by their respective ALSMs. (This method may typically be used in state specific hearings dealing with UNEs). If this approach is used, the ALSM output is input directly into the Service Specific Investment Process through a special input table. BCPM combines the total switch investments from the ALSM output into the set of BCPM investment buckets. The ALSM investments input should be discounted using company-specific discounts in their development.

7.4.3.3 Other Investment Method

This method allows for the input of investments from sources other than BCPM or the ALSMs. A special table is provided for the input of a total switch investment. This investment, as with the others, should be vendor E,F,&I, and should be discounted. The user will need to identify the switch as host, remote, or standalone, and identify the vendor if possible. BCPM separates this total investment into functional investment categories using a percentage of investment by category developed in the BCPM Investment Process. An intermediate calculation in BCPM computes the average bucket shares for that area by Standalone, Host, and Remote switches.

7.4.3.4 Switch Investment Refinement Process

This process selects the appropriate set of switch FCAT investments (BCPM, ALSM, or Other) to be used in the final service investment process. The result is a matrix of validated Total Switch Functional Investments by CLLI code and functional category. If FCC or other data have been supplied via the Other Investment Process, then that data will be selected for each CLLI. If such data have not been input for a CLLI, the Model looks to see whether ALSM data have been supplied, and if so, uses the ALSM data. If none of the alternative data sources has been supplied, the output from the BCPM Functional Investment Process passes through.

7.4.4 Service Specific Investment Development Process

The purpose of the Service Specific Investment Process is to calculate the per unit switching investments for universal service. The switching investments are later combined with other investments, for example transport and signaling investments, to produce a complete cost study for the service or rate element.

7.4.4.1 Unitizing Process

This process breaks the Installed Total Switch Functional Investments down into Unit Switch Functional Investments for each CLLI code. First, the Model sets aside the portion of total FCAT investment that is not related to basic calling. For example, based on the Feature Loading Multiplier, the Model can define that 20% of the Processor Related category investment is related to features. That portion of investment would be excluded from the basis of the Processor Related unit investment. The unitizing is accomplished by dividing the total FCAT investments by the capacity constraint relevant to that category:

Functional Category	Divisor (Capacity Constraint)
Processor Related	Number of Busy Hour Calls
Line Termination - MDF & Protector	Number of Lines
Line Termination - Line Port	Number of Lines
Line CCS	Number of Line CCS
Trunk CCS	Number of Local Trunk CCS
SS7	Number of Basic Busy Hour Calls

The number of Busy Hour Calls is computed by adding the originating, terminating, outgoing, and incoming call setups for each line. Each type of call setup is considered one transaction or "call" for the purpose of this calculation. This number is derived by first computing a weighted number of BH local calls for residence and business. The weighted number of BH toll calls then is computed. The number of originating & terminating call attempts is the total of local and toll calls times two. The number of outgoing/incoming calls is determined by multiplying the local interoffice calls (computed from a default table input percentage) plus the toll calls times two.

The number of Line CCS is computed by multiplying the total residence CCS per line (local and toll) by the number of residence lines and the number of business CCS per line by the number of business lines. The total Trunk CCS is computed by multiplying the calculated number of trunks by the average CCS per trunk, a state default input. The results of the Utilizing Process is a matrix of Unit Functional Switch Investments by CLLI code and functional category.

7.4.4.2 Calculate Universal Service Portion of Investment by Switch

The next step is to determine the total investment attributable to universal service for each switch. This is done by multiplying the FCAT unit investments by the appropriate quantities.

Functional Category	Multiplier
Processor Related Inv. Per Call	Number of Busy Hour Local Calls per Line (Res & Bus) * Number of Lines
Line Termination - MDF & Protector per Line	1*Number of Lines
Line Termination - Line Port per Line	1*Number of Lines
Line CCS Usage per CCS	Number of Busy Hour Local CCS per Line (Res & Bus) * Number of Lines
Trunk CCS Usage per CCS	Number of Local Trunk CCS per Line (Res & Bus) * Number of Lines
SS7 Inv. Per Outgoing Call	Number of Basic Busy Hour Outgoing Calls per Line (Res & Bus) * Number of Lines

7.4.4.3 Calculate Unit Vendor Investment per Line by Switch

The Model calculates a universal service investment per line by taking the total USF investment from each FCAT and averaging it across either the switch, the rate center, or the host/remote complex, as appropriate. The purpose of this step is to accurately reflect the actual cost characteristics of each unique serving area, while at the same time ensuring that host resources are appropriately shared across each host/remote complex.

Functional Category	Allocation Basis
Processor Related Inv. Per Line	Rate Center
Line Termination - MDF & Protector per Line	CLLI
Line Termination - Line Port per Line	CLLI
Line CCS Usage per Line	CLLI
Trunk CCS Usage per Line	Host/Remote Complex
SS7 Inv. Per Outgoing Line	Host/Remote Complex

The processor investment per line is determined by a three-step process that allocates the host processor investment across all switches on the host/remote complex. The first step is to divide the total USF processor investment for all switches on the complex by the total number of lines on the complex. This produces a host processor investment per line. The second step is to divide the processor investment for each remote switch by its associated number of lines. This produces a remote processor investment for each remote. The final step is to compute the total processor investment per line for each switch. For standalone switches, this is simply the processor investment from step 1. For hosts and remotes in the same rate center, the per line investment is the weighted average of the host investment for the host and the host plus remote investments for each remote. This produces a single processor investment per line for all switches in the rate center. For remotes located outside the host rate center, the processor investment is the sum of the host processor investment per line and the remote processor investment per line.

The trunking and SS7 host office investments must be allocated by complex, since remotes are assumed not to have these facilities and use the trunking and signaling resources of the host. For each complex, BCPM divides the host USF trunking investment by the local trunk usage for all switches on the complex. SS7 investments are handled similarly.

7.4.4.4 Installed Investment Process

The Switch Investment Refinement process results in a number that represents the material cost from the vendor for the switching equipment. To develop the total Installed (working) investment, investment loading factors must be applied to account for the additional activities and equipment necessary to install and support the switch. The factors applied are as follows:

- LEC In-Plant Factor - Telephone company labor and material needed to install the switch;
- Land and Building Factors - Central office floor space required by the switch;
- Power and Common Equipment Factors - Central office power plant equipment and miscellaneous equipment such as racks and bays needed to support the switch; and
- Sales Tax - In many states, sales tax is applicable to the material portion of the switch investment.

The output of this process is a matrix of Installed Unit Switch Functional Investments by CLLI code and functional category.

SECTION 8.0

TRANSPORT

8.1 Introduction

In the Transport Cost Proxy Model (TCPM) module, BCPM 3.0 uses information on existing interoffice traffic routing relationships between remote/host/ tandem switches to develop forward looking transport costs using SONET technology.

TCPM deploys sophisticated optimization algorithms to determine the most efficient ring configuration for a given study area. These optimization algorithms utilize actual data on remote-host-tandem switch homing[38] relationships, V&H coordinates, number of working lines, and access line to trunk ratios (used to derive traffic characteristics). The TCPM module is an extremely flexible Excel spreadsheet model, permitting cost analysis for an area as small as a single exchange or as large as an entire company. The user also has the ability to alter all of the primary transport cost inputs.

The Model develops a cost per line for the entire SONET ring. This cost can then be assigned to individual switches on the ring based on their unique characteristics.

8.2 BCPM 3.0 Enhancements

In its earliest versions, BCPM included only a simple transport multiplier in its analysis of costs to be attributed to supported services. BCPM 3.0 methodology has taken a dramatic step forward by creating a realistic model of the interoffice network based on the actual homing relationships between remotes and hosts, and hosts and tandems. It then develops specific and accurate cost elements based on trunking configurations of specific nodes[39] on the network.

TCPM in BCPM 3.0 has a number of important features. The module:

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[38] Homing relationships summarize current trunking designs between switches for interoffice traffic.

[39] A node is the location of a SONET electronic device on a ring in a central office.

1. Utilizes efficient SONET bandwidth (OC3, OC12, OC48), given the specified host and remote locations, number of access lines, and trunks;
2. Uses only SONET technology that is currently available in the market;
3. Provides one level of redundancy via what is commonly referred to as self-healing rings;[40]
4. Provides a second level of redundancy by using two sets of lines for offices served by a folded ring;[41]
5. Includes a third level of redundancy by providing one extra DS1 for every seven working DS1s on the port side in a central office;
6. Determines the number of rings to be built and the sequences of nodes on the ring;
7. Allows the user to run the Model for a single ring, thereby enabling the user to trace the cost calculations through the logic of the Model;
8. Maps the nodes subtending a particular host or tandem; and
9. Provides the following reports for each ring: a) transport cost results for all of the rings; b) transport configuration of all of the rings; and c) universal service transport cost on a per line basis.

8.3 SONET Overview

Synchronous optical network (SONET) is a set of standards for optical (fiber optic) transmission. It was developed to meet the need for transmission speeds above the T3 level (45 Mbps) and is generally considered the standard choice for transmission devices used with broadband networks. Technologies like T3 are likely to be replaced by new services offered through a SONET platform. By way of comparison, OC-1 can carry over 30 times more data than DS1.

SONET enables more efficient use of installed fiber; it taps the latent capacity already in the network. SONET allows new network configurations, including ring networks, which have a greater degree of survivability than traditional mesh networks.

[40] If the fiber cable in a "self healing" ring is cut the signals will automatically reverse their direction on the ring.

[41] A folded ring connects an office to a single node on the SONET ring.

8.4 Transport Model Methodology

8.4.1. Model Inputs

To run the Model, three sets of inputs are required. The first includes Local Exchange Routing Guide (LERG) data that specifically identifies and locates the in place switching network. That information includes:

A. Operating Company Number;
B. Local Name of the switch;
C. Eleven digit CLLI code of the switch;
D. V&H coordinates of the switch;
E. CLLI code of the tandem serving the switch;
F. CLLI code of the host for remote offices; and
G. V&H coordinates of the host (if a remote office) or tandem.

The records are sorted to list each host office followed by all of its remote offices, and each tandem followed by each of its subtending offices. (Note: a host office with remotes appears on this list twice, once with its remotes and once with its associated tandem).

The second set of inputs includes those required to set thresholds in the Model. The user may provide these specifications or use the provided default values. The variables include:

1. Maximum number of nodes per ring;
2. Airline miles to route miles factor;
3. Line to trunk factor;
4. Tandem trunk factor;
5. Ratio of Special access lines to switched lines;
6. Size of SONET systems available and the maximum fill factor for each;
7. Number of minutes of traffic per DS1 (assumed);
8. Whether or not route diversity is assumed in the case of a folded (two point) ring;
9. Maximum distance between rings allowed without requiring repeaters;
10. EAS/Exchange percentage of minutes of use;
11. Material Costs;
12. Engineering/Installation Labor costs; and

13. Utilization Factors.

The final set of inputs is the number of access lines served by the switch as determined by the loop module.

8.4.2 Running the Model

8.4.2.1 Building the Rings

The Model begins by creating a forward-looking ring connecting all remotes to their hosts and hosts to their tandems. It assumes that all remote offices are connected to their respective host offices by SONET rings. If there is only one remote, a folded ring is assumed. All host offices are connected to their tandems by SONET rings. A ring with only three nodes is already considered optimized.

The Model designs the rings using a sorting process based on distances between remotes and hosts and sizing the rings based on preset input variables. The algorithm for this process is the following:

A. If there are less than four nodes, including the host, stop. (A ring with only three nodes is by definition optimized.) Move to sizing the ring.

B. Sort the remaining nodes in order of distance from the host.

C. Find the two non-collocated nodes that are nearest to the host.

D. Define a 3 segment ring connecting the host and these two points, (in the attached diagram the host is point A, the other two points are B and C).

E. Find the next nearest node to the host (labeled D in the diagram).

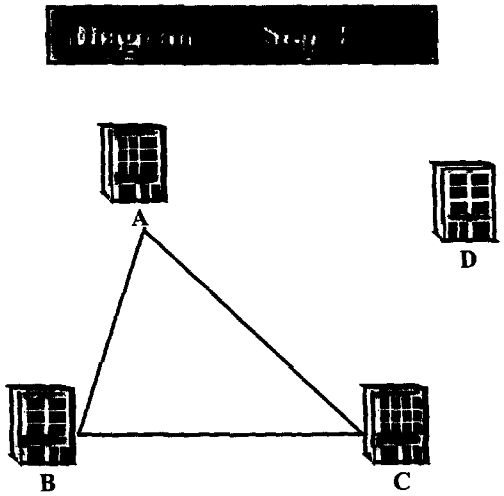
F. Determine the distance from the new point to each current point on the ring (AD, BD and CD).

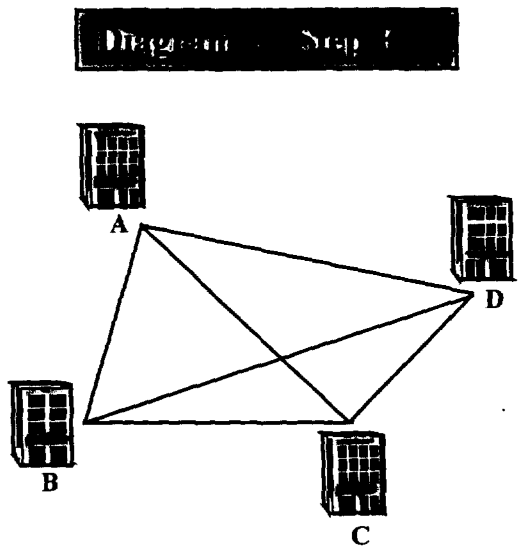
G. For each segment on the ring, calculate the sum of the distances from the new point to each of the endpoints of that segment, less the length of the segment.

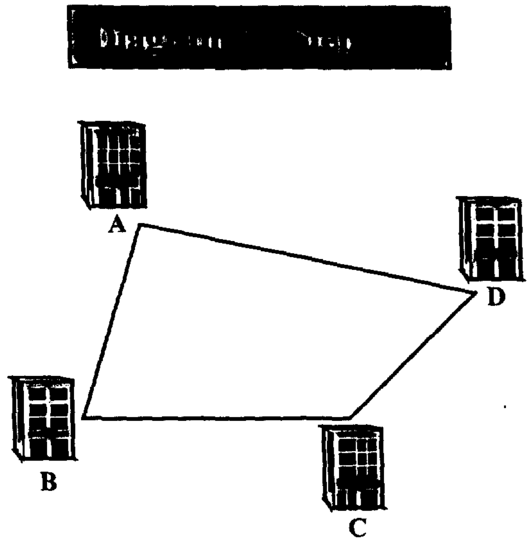
   1. AD + BD - AB
   2. AD + CD - AC
   3. BD + CD - BC

H. Choose the segment with the shortest net distance in step G. In our example, this would be number 2 - segment AC.

I. Replace this segment with two new segments connecting the new node to the end points (so that the ring now goes from A to B to C to D and back to A).







J. If there are more nodes to include, return to step E.

K. If the number of nodes exceeds the user specified maximum:
   1. Divide the number of nodes by the maximum and round up to determine the number of rings that are needed.
   2. Divide the number of nodes by the number of rings to equalize the rings.
   3. Starting at the host, traverse the ring until the number of nodes determined in step 2 has been passed.
   4. Replace the next segment with a new segment from the current node back to the host, and a segment from the host to the next node in the sequence.
   5. If more than 2 rings, repeat steps 3 and 4 until all rings are built.

8.4.2.2 Sizing the Rings

After the rings are designed, the Model proceeds to determine the appropriate bandwidth required for each of the rings. This process begins by analyzing the number of switched access lines served by the ring. After determining special access circuit needs, it builds the proper number of DS1s and DS0s to accommodate the ring's traffic. A Ring Size Table then finds the capacity of the ring.

For each ring the Model performs the following calculations:

1. Calculate the total number of switched access lines served by the exchange.
2. Divide this number by the line to trunk (or tandem trunk) factor to determine the number of DS0 trunks required.
3. Divide this number by 24 to determine the number of DS1s required.
4. Multiply the number of switched access lines by the special access factor to determine the number of equivalent DS0 trunks required for special access circuits.
5. Divide this number by 24 to determine the number of DS1s required for special access.
6. Add the number of DS0s from steps B and D to get total DS0s.
7. Add the number of DS1s from steps C and E to get total DS1s.
8. Use the Ring Size Table on the control page to determine the minimum size of the ring required to serve these DS1s.
9. Use the Ring Size Table to find the total DS0 capacity of this ring.
10. Divide the total capacity by the required DS0s to determine the fill.

8.4.2.3 Costing the Rings

For each ring, the beginning and endpoints of each segment, the mileage between, the ring size (OC3, OC12 or OC48), and the fill factor are passed to the costing logic. If any of the segments are more than 45 miles, an appropriate number of repeaters is specified.

From the ring characteristics, the costing logic determines the investment required, converts total utilized investment of each type of transmission equipment into a cost per DS1, selects the appropriate mileage elements, and computes the cost per common transport minute.

The following provides additional detail about costing the rings.

For each ring, the beginning and endpoints of each segment, the mileage between, the ring size (OC3, OC12 or OC48), and the fill factor are passed to the costing logic. If any of the segments are more than 45 miles, an appropriate number of repeaters is specified.

The costing logic determines the investment required from the ring characteristics and converts total utilized investment of each type of transmission equipment into a cost per DS1. The appropriate termination equipment components are selected from the following list: Fiber Tip Cable, Fiber Patch Panel, Fiber Optic Terminal, DS3 Card, DS1 Card, OC3 Card, DSX3 Cross Connect, DSX1 Cross Connect Jack Field, Channel Bank, and Channel Bank Card. The following illustrates the termination equipment calculation:

[(Equipment Component Investment * Units Required) / DS1 Capacity] / Utilization Factor * (1+Power Factor) * Annual Charge Factor = Annual Cost Per DS1 by Equipment Component

Based on the ring characteristic, the following mileage equipment components are utilized, as appropriate, within the costing logic associated with the transit cost element: aerial fiber, underground fiber, buried fiber, pole lines and conduit.

The following illustrates the mileage equipment calculation:

[(Unit Investment Per Mile * Units Required) / Fiber Utilization Factor] / Terminal Utilization Factor * Annual Charge Factor = Annual Cost Per DS1 by Equipment Component Per Mile

Annual Cost per DS1 by Equipment Component Per Mile * Fiber Mix Ratio = Weighted Annual Cost Per Mile by Equipment Component

Sum all components by the ring size and the result is a weighted annual cost per mile.

The cost per common transport is developed by taking the dedicated DS1 transport cost results and dividing the single termination and transit cost elements by 216,000 minutes. 216,000 minutes of use per DS1 is equal to 9,000 minutes of use per DS0 times 24 voice-grade circuits per DS1.

8.4.3 Results

Results are provided for public switched network common transport on an individual ring basis, recognizing the use of existing LEC wire centers, mileage characteristic, and each ring's specific utilization. The common transport results are utilized in the development of the universal service fund monthly transport cost per line by exchange.

SECTION 9.0

SIGNALING

9.1 Introduction

Signaling costs for use in developing per line investments for BCPM 3.0 are provided through a user input table which reflects the cost of building a modern SS7 network. The input table provides investments for Residence and Business lines for Small, Medium, and Large companies. The signaling cost for a wire center is based on a weighted average of residence and business lines associated with that wire center. Values in the input table are developed by running the BCPM Signaling Cost Proxy Module (SCPM)[42] for portions of the U S WEST territory.

Users have the option to either use the provided default values or input their own values. A Beta version of the SCPM is available at the BCPM web site for users who wish to develop signaling investment figures based on their own network configuration. A future release of BCPM will incorporate the SCPM module into BCPM.

In general, analysis from SCPM data runs indicates that signaling accounts for less than 1/2 of one percent of total per line investment.

9.2 BCPM 3.0 Enhancements

In previous releases of BCPM, a portion of the signaling cost was included in the switch investment. BCPM 3.0's approach for determining signaling costs differs substantially from the method used previously. Values in the BCPM Signaling Input Table are created by analyzing data produced from SCPM. SCPM:

- Creates a two tiered SS7 Signaling network using a combination of user definable inputs and LERG data;
- Uses the existing SS7 signaling network as the basis for the SCPM network;

[42] A detailed discussion of SCPM methodology is included in the November 1997 version of the Benchmark Cost Proxy Model Release 3.0 Model Methodology.

- Uses actual data to develop the octet, millisecond and data dip needs of the network as the foundation elements to determine signaling investment; and
- Takes the octet, millisecond and data dip needs of the network and calculates the proper number of packet switches, on line data bases and signaling links.

SECTION 10.0

SUPPORT PLANT

10.1 Introduction

Once the Model calculates the loop, switching, and interoffice plant (excluding land and building) needed for each Grid, user adjustable investment ratios are used to load in the support investments. Support investment represents those plant items not directly used in the provisioning of basic service.

10.2 Support Investment Methodology

BCPM 3.0 produces estimates of total investment less support investment in the loop module. Land and building investment estimates are generated in the switch module. The remaining investment estimates, i.e. support investments, are provided in the Report Module.

Support investment estimates are derived through the application of support factors, whose values are directly specified by the user. These factors represent the ratio of support investment in various accounts to total investment, less support, land, and building investment. BCPM 3.0 allows the user to specify support factors for three size classifications of companies: small, medium, and large.

The support accounts are as follows:

Network Support:	2112 Motor Vehicles
	2114 Special Purpose Vehicles
	2115 Garage Work Equipment
	2116 Other Work Equipment
	Total Network Support = 2112 + 2114 + 2115 + 2116 + 2111 (Land)
General Support:	2122 Furniture
	2123 Office Equipment

2124 General Purpose Computers
Total general Support = 2122 + 2123 + 2124 + 2121 (Buildings)

As an example, consider the default support ratios shown in the following Table . Assuming a total investment of $1 million, land investment of $100,000 and building investment of $250,000 yields the following estimated annual support investment (uncapped).

	Relevant Investment	Support Ratio	Support Investment
2112 Motor Vehicles	$ 1 million	1.34 %	$ 13,400
2114 Special Purpose Vehicles	$ 1 million	0.00 %	$ 0
2115 Garage Work Equipment	$ 1 million	0.04 %	$ 400
2116 Other Work Equipment	$ 1 million	0.93%	$9,300
2111 Land			$100,000
Total Network Support			$123,100
2122 Furniture	$ 1 million	0.30 %	$3,000
2123 Office Equipment	$ 1 million	0.78 %	$7,800
2124 General Purpose Computers	$ 1 million	2.15 %	$21,500
2121 Buildings			$250,000
Total General Support			$282,300

SECTION 11.0

CAPITAL COSTS

11.1 Introduction

The BCPM 3.0 Capital Cost Module develops a series of annual charge factors for Depreciation, Rate of Return and Tax Rates that when applied to individual investment categories developed in other modules, produce capital costs for use in developing Universal Service Fund costs.

11.2 Annual Cost Factors

To develop annual charge factors, BCPM 3.0 includes a powerful yet simple model that allows the user to vary the basic inputs to arrive at the Depreciation, Cost of Capital, and Tax Rates for each account. This account by account process was designed to recognize that all of the major accounts have differing economic lives, salvage values, cost of removal, tax lives, and survival curves, that ultimately lead to distinct capital costs. The module incorporates all of the methodologies that are currently in practice today, including: Deferred taxes, Mid-year, Beginning Year, and End Year placing conventions, Gompertz-Makeham Survival curves, Future Net Salvage Values, Equal Life Group methods, and many others. The module also incorporates separate Cost of Debt and Equity rates, along with the Debt to Equity ratio.

11.3 Applying Cost Factors to Investment Accounts

Once the annual charge factors are developed, they are multiplied by the investment developed in previous modules (account by account) to arrive at yearly capital costs. These yearly amounts are then converted to a monthly amount.

The Annual charge factor categories include:

Rate of Return,
Depreciation,
FIT,
State Taxes, and

Other Taxes.

11.4 User Adjustable Inputs

All of the variables included in the Capital Cost Module are user adjustable. The default values for lives, salvage, and cost of removal are based upon a LEC industry data survey requesting forward looking values. The curve shapes of the survival patterns are provided by the United States Telephone Association (USTA) capital recovery group.

A second set of inputs is provided to comply with the FCC's 10 criteria with respect to rate of return and economic lives.